Poster 4. Water availability and winter wheat yield in eastern Colorado.

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The yield of winter wheat in eastern Colorado is constrained by water availability during the growing season. Water shortage may occur at anytime throughout the growing season but may have the greatest impact at three growth stages. In the autumn, lack of water may decrease seed germination and plant stand. In early spring, the wheat plant is coming out of cold dry winters and may suffer from drought until spring rains come. Later in the season, especially around flowering and during grain filling, temperatures increase and precipitation may not meet the ET requirements. In order to determine when water shortage has a more dramatic impact on winter wheat yield, 24 winter wheat genotypes (experimental lines and cultivars) adapted to the High Plains were planted under five water treatments, ranging from full irrigation to dryland. Three intermediate treatments targeted two main wheat developmental stages, jointing and anthesis. The ANOVA of yield and yield components showed that there were strong genotype and water-treatment effects and 'genotype x water treatment' interaction for yield. Correlations across water treatments between yield and yield components showed that yield was mostly related to the number of grains per unit area, which in turn was related to the number of spikes per unit area and the number of grains per spike. The 'genotype x water treatment' interaction was analyzed in terms of differences of yield formation of the different cultivars grown in different water treatments. From our results, we can conclude that the number and size of spikes (in terms of number of spikelets per spike) are important traits for winter wheat yield in eastern Colorado across a range of water availabilities.

Poster 5. Introgression and characterization of stem rust resistance from Aegilops tauschii Coss.

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An evaluation of a diverse set of 454 accessions of *Ae. tauschii* with six races of the stem rust pathogen *Puccinia graminis* f. sp. *tritici* Pers. identified 198 lines with seedling resistance. Of the accessions with resistance, 14 with resistance to nearly all races were targeted for introgression of stem rust resistance genes into hexaploid wheat, *Triticum aestivum* L., by direct crossing of the *Ae. tauschii* accession (2n=2x=14) with hexaploid wheat (2n=6x=42). A hard white winter wheat, KS05HW14, previously identified as having high crossability, and the spring wheat WL711 were used as females with the *Ae. tauschii* accessions as males. Embryos were rescued between 14 and 18 days-after-pollination. Embryo maturity was highly variable depending on the *Ae. tauschii* genotype. Upon the production of shoots, plantlets were transferred to a modified MSE medium until the full development of roots and then placed in vernalization. Currently, dihaploid F_1 plants (ABDD) have been generated for nine *Ae. tauschii* genotypes. One *Ae. tauschii* genotype produced few embryos for rescue but was present in a synthetic from which F_1 seed was produced with the KS05HW14 parent as a female. The sterile F_1 plants will be backcrossed as females to the hexaploid parent to restore fertility. A bulked-segregant analysis of the BC_1F_2 or BC_2F_1 genotypes with SSR markers will identify loci linked to stem rust resistance genes and determine the chromosome location of the genes for subsequent linkage analysis.

In a separate evaluation of stem rust resistance in *Ae. tauschii*, accessions CDL4424 and CDL4366 were identified as having seedling resistance to stem rust. These accessions were crossed directly to KS05HW14 and WL711. A bulked-segregant analysis of a BC_2F_1 population from CDL4424 revealed two SSR loci polymorphic between resistant and susceptible bulks, *Xwmc222* and *Xbarc119*, on chromosome 1DS, which is the same chromosome location as the previously described genes from *Ae. tauschii*, *Sr33* and *Sr45*. Allelism test crosses will be made between CDL4424 and the diploid accessions carrying *Sr33* (TA1600) and *Sr45* (TA1599).